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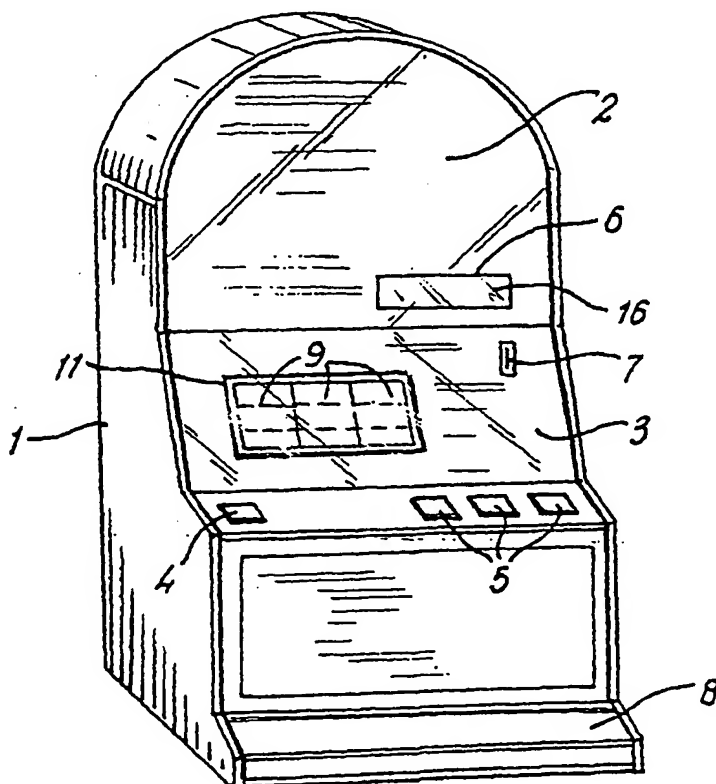
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(54) Title: DISPLAY SYSTEM FOR ENTERTAINMENT MACHINE



(57) Abstract: A coin-operated entertainment machine has a digital display device (16) and a monitoring device (19). Machine signals are monitored and an error indication is given if there are anomalous signals. The player of the machine is thereby made aware that a malfunction has occurred. In one embodiment, an error indication is given if a predetermined value, such as a maximum jackpot award, is exceeded. In another embodiment repeated machine signals are monitored and an indication is given if there is a departure from a norm indicating a machine crash or other malfunction.

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DISPLAY SYSTEM FOR ENTERTAINMENT MACHINE

This invention relates to a display system particularly for an entertainment machine of the kind which is operable by a player to play a game.

5           The invention is especially although not exclusively concerned with coin operated entertainment machines such as amusement or gaming machines of the 'fruit' or 'poker' kind operable by a player to play a game in which a combination of symbols is selected at a win zone. As used herein the term coin-operated is intended to cover operation by coins,  
10           tokens, bank notes, credit cards, cash cards, pre-paid cards or any other form of credit or monetary value.

Coin-operated fruit machines commonly have a digital display device, such as a multi-digit alpha-numeric LED display device, on which values, such as game-playing credits, awards and the like, can be displayed.

15           The display device is typically controlled by signals from the usual microprocessor control unit of the machine. In the event that an error occurs resulting in the transmission of anomalous signals, the display device may display an incorrect value. For example, the device might give a default display of '9' for each digit.

20           In this case, unaware of the error condition, the player might consider that he is entitled to the benefit of the incorrect displayed value, which could represent an award considerably in excess of that to which the player

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is properly entitled.

One object of the present invention is to avoid misleading the player with incorrect value displays in error conditions.

According to one aspect of the invention therefore there is provided  
5 a display system particularly for an entertainment machine of the kind which is operable by a player to play a game, wherein the system comprises a display device connected to a control unit of the machine to produce a display under the control of signals received from the control unit, characterised by the provision of a monitoring device which monitors the  
10 signals and is responsive to the occurrence of anomalous signals to produce an error indication determined by such occurrence.

With this arrangement, if anomalous signals arise, these can be intercepted and an appropriate display can be produced thereby to avoid misleading the player.

15 The occurrence of anomalous signals may be identified in any suitable manner.

In one embodiment, identification is effected in relation to a pre-set or notified maximum value, whereby the error indication is produced when this value is exceeded. Thus, for example, where there is a maximum  
20 jackpot award of say £200, an error indication could be produced when signals are received which correspond to a higher value.

The monitoring device may be pre-set with the maximum value.

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Alternatively or additionally the monitoring device may be notified of the maximum value by the control unit of the machine.

The notified maximum value may be supplied from the control unit to the monitoring device at an appropriate operational stage e.g. on power-up or at some other initial or starting stage.

To avoid errors in the notified value e.g. due to variable factors or problems at power-up or variations arising from unused segment patterns of the display device, the notified value may be derived from multiple supplied values e.g. from the modal average of a predetermined number of first supplied values for each digit.

The monitoring device may incorporate local memory for storing the notified value.

Alternatively or additionally to monitoring an exceeded maximum value, the monitoring device may respond to signals representing any other rogue value or anomalous or incorrect event or condition, such as a value outside a permitted range, a value occurring at an incorrect occasion or timing or with an incorrect frequency.

In like manner to the above mentioned maximum value, any such other rogue value or anomalous or incorrect event or condition may be identified with reference to a pre-set or notified parameter which may be stored in memory local to the monitoring device.

The occurrence of anomalous signals which causes production of the

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error indication for this other monitored rogue value or anomalous or incorrect event or condition may constitute the existence or absence of a signal or signals.

5           Advantageously this feature may be utilised to provide a 'watchdog' facility whereby normal operation of the control unit is monitored and an error indication is given in the event that an error condition arises whether or not related to production of a display on the display device. In this way it can be ensured that the player is made aware that an error condition, such as a system crash, has occurred.

10           A further object of the present invention is therefore to monitor operation of the control unit and ensure that the player can be made aware of an error condition in the normal operation of the unit.

          According to a further aspect of the invention there is provided a display system particularly for an entertainment machine of the kind which  
15           is operable by a player to play a game, wherein the system comprises a display device connected to a control unit of the machine to produce a display under the control of display signals received from the control unit, characterised in that the display device is also arranged to receive predetermined monitor signals from the control unit, and a monitoring  
20           device is provided which is responsive to the occurrence of anomalous such monitor signals to produce an error indication determined by such occurrence.

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In one embodiment of this further aspect of the invention, the monitoring device may be arranged to receive repeated signals from the machine control unit whereby the error indication is produced if there is a predetermined departure from a norm e.g. a missing signal or wrong signal frequency or the like which might indicate incorrect operation of the control unit or a system crash or the like. Thus, the control unit may supply a code or pulse every 100 milliseconds whereby the error indication is given if a code or pulse is not seen or is not at the correct time.

The further aspect of the invention may be combined with the first aspect.

The error indication for either aspect of the invention may be produced on the said display device and/or on an auxiliary display device, and may take any suitable form. Thus, the error indication may constitute the word ERROR or ERR, or it may constitute a default value, or the blocking of any value, or an informative message, or a symbol display or any other form of indication.

Where multiple kinds of anomalous signals are monitored, e.g. where an exceeded maximum value and also an irregularity in a repeated control unit signal are both monitored, there may be a common error indication, or different error indication which may be arranged to identify the nature of the error occurrence.

The monitoring device may also be operable to control production of

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one or more displays on the or each display device, for any suitable purpose additional to production of the error indication. Thus, the monitoring device may be operable to produce information displays, special effects for alerting or entertainment purposes, such as starbursts, and the like.

5           The or each display device is preferably a multidigit alphanumeric display device such as an LED device which may have a multicolour capability. However, any other suitable kind of device may be used alternatively or additionally.

10           The or each display device may form an integrated self contained unit with the monitoring device with external connections for the signals from the machine control unit, and possibly also for power supply, whereby conveniently the display system can be installed as a separate unit within a machine. The device may be provided on a printed circuit board with a microchip which controls operation of the device and incorporates the  
15           monitoring device.

          The display system of the invention is preferably used with a coin-operated entertainment machine, particularly a coin-operated fruit or poker machine as mentioned above.

20           The invention will now be described further by way of example only and with reference to the accompanying drawings in which:-

Figure 1       is a diagrammatic representation of one form of a machine according to the invention;

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Figure 2 is a block circuit diagram of the machine; and  
Figure 3 is an enlarged diagrammatic representation of a display device of the machine.

Referring to the drawings, these show a fruit machine having a box shaped housing 1 having a front wall which includes upper and lower glass panels 2, 3, a number of operating buttons 4, 5, a coin slot 7 and a payout opening 8.

Within the housing 1 there are three axially aligned reels 9 having say 20 symbols at regularly spaced positions around their peripheries. The reels 9 are axially rotatable and are drivably connected to respective stepper motors 10. The reels 9 are arranged behind a window 11 defined by a printed region of the lower glass panel 3. Each reel 9 can be arrested by the respective stepper motor 10 in any of 20 stopping positions in which one symbol is in precise registration with a horizontal win line in the centre of the window 11 and two further symbols are visible above and below the win line. The three reels therefore display a matrix of 3x3 symbols in three columns (i.e. the three reels) and three rows (across the three reels).

The stepper motors 10 are connected to a microprocessor-based control unit 12 within the machine housing 1. This unit is also connected to a coin-mechanism 13, a payout mechanism 14, the buttons 4, 5 and a display device unit 16 yet to be described, which incorporates a multidigit alphanumeric LED display device 17 which can be viewed through a

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window 6 defined by a printed region of the upper glass 2.

5 In use, the player inserts coins into the coin mechanism 13 through the slot 7 sufficient to generate credit for one or more games, and the machine is actuated so that a game can now be played. The game commences after a start button 4 has been pressed and reels 9 spin and then come to rest at random (or pseudo random) so as to select a combination of symbols displayed on the win line. The displayed symbol combination is assessed by the control unit 12 and a win indication is given in the event that the combination is of a predetermined winning nature.

10 In conventional manner, e.g. using buttons 5, additional or alternative procedures may be made available for attaining or enhancing or seeking to influence wins, as for example by playing feature games, using 'holds', 'nudges', 'gambles', etc., and provision may be made for a jackpot award dependent for example on the selection of special jackpot symbols or the like.

15 When a win is attained, the value of this may be shown on the display device 17 and the player may have the opportunity of obtaining a corresponding pay out and/or by utilising some or all of the shown value for playing further games.

20 The display device unit 16 receives signals from the control unit 12 which represent numerical award values to be displayed and which are interpreted by circuitry 18 associated with the unit 16 so that the

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corresponding numerals are shown, by actuation of appropriate LED segments, for each digit 15 of the display device.

5 The display device 17 and its control circuitry 18 form a separate display unit 16 which incorporates as part of the circuitry 18 a monitoring device 19. This display unit 16 in physical terms comprises a printed circuit board with a microchip, providing the control circuitry 18 and the monitoring device 19, mounted on the board together with the LED display device 17. The board also has connectors for connection to the microprocessor control unit 12 and to power supply.

10 The monitoring device 19 comprises local memory 20, and comparison circuitry 21. The local memory 20 stores parameters related to normal operation of the machine. In particular, the memory 20 stores a signal frequency parameter related to a timing clock of the comparison circuitry 21, and also a maximum jackpot value.

15 In normal operation of the machine, the control unit 12 supplies a continuous signal train to the display unit 16 made up of predetermined pulses or codes at fixed intervals say every 100 milliseconds. The comparison circuitry 21 compares this with a stored pulse or code identity and frequency whereby the comparison circuitry 21 produces an error  
20 output in response to a predetermined departure of the received signal train from the stored parameters of pulse or code identity and frequency. The arrangement may be such that any change triggers the error output, or it

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may be such that only changes outside a predetermined range (say  $\pm 20\%$ ) trigger the output.

5 The display unit 16 thereby performs a continuous watchdog function. A malfunction or crash of the machine control unit is detected and triggers the production of the error output.

The error output is used to produce a display on the LED display device 17 which may be the word ERROR or ERR, overriding any existing display. This error display may persist until the machine is reset.

10 In the absence of an error output, i.e. when the received signal train meets the stored parameters, the LED display 17 is operative to display usual values and messages.

Whenever a jackpot is attained, signals are received by the display unit 16 representative of the jackpot award value which has a predetermined maximum, say £200, and the LED display device is operated to display numerically this value.

20 All award value indicating signals received by the display unit 16 are compared with the stored maximum jackpot value. In the event that a signal is received at any time which corresponds to a value in excess of this maximum value, the comparison circuitry 21 produces the above mentioned error output and the LED display device 17 shows ERROR or ERR, overriding any other display, and this may persist until the machine is reset.

The stored parameters may constitute pre-set parameters of the

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display unit 16 incorporated during manufacture. Alternatively, the parameters may be notified by the machine control unit 12 e.g. on power up when the machine is first switched on. Thus, as part of a start up routine the machine control unit 12 may supply the above mentioned signal train, and also the maximum jackpot value for storage in the memory. To avoid incorrect parameters due to power up problems, the signal train and maximum value may be monitored for a predetermined time or cycle or number of times to average out any errors.

With the arrangement so far described an indication is given of the occurrence of any anomalous signals or control unit crashes which usually result in no data, wrong data or data at an incorrect rate.

The error indication is displayed to the player so that he is made aware that an error has occurred. As mentioned, the error display may persist, even if game play is permitted to continue.

The display unit 16 also provides a convenient means of enhancing normal displays for entertainment and/or information purposes, by making use of unused segment patterns to give special effects, such as starbursts, bi-colour effects, to differentiate commands and the like.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiment which are described by way of example only.

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CLAIMS

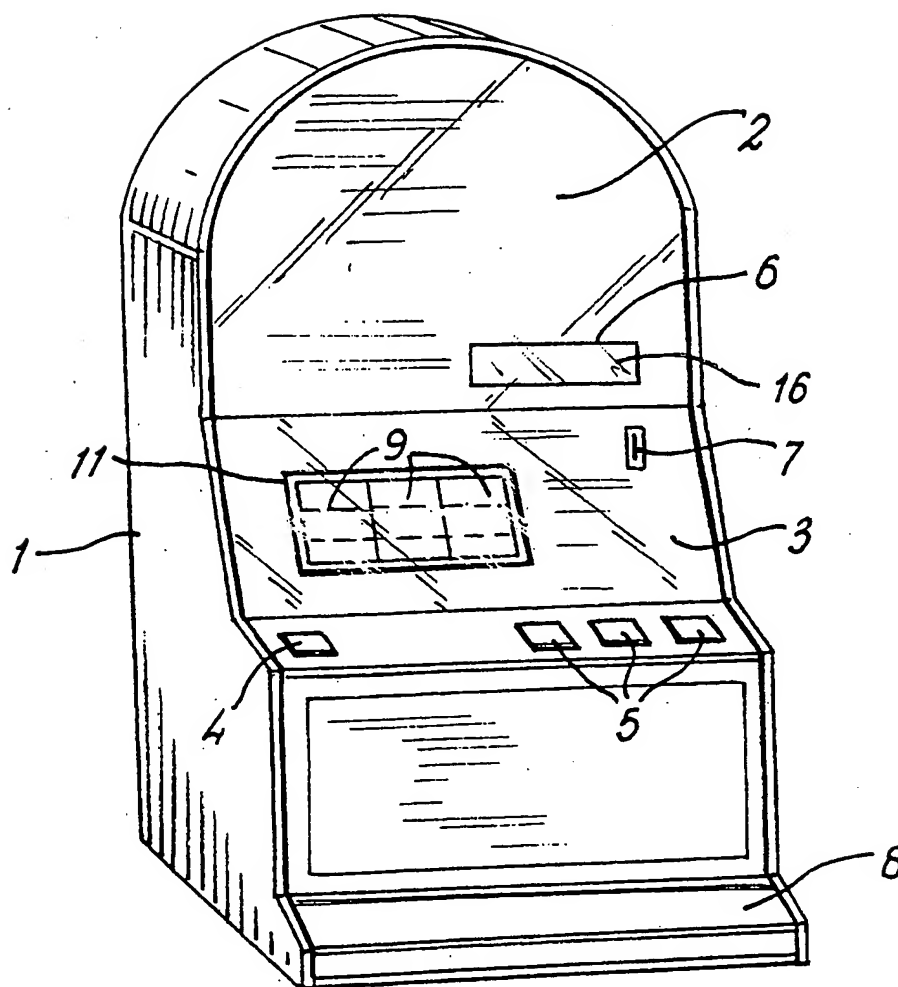
1. A display system particularly for an entertainment machine of the kind which is operable by a player to play a game, wherein the system comprises a display device connected to a control unit of the machine to produce a display under the control of signals received from the control unit, characterised by the provision of a monitoring device which monitors the signals and is responsive to the occurrence of anomalous signals to produce an error indication determined by such occurrence.
2. A system according to claim 1 wherein the error indication is given with reference to a pre-set or notified parameter.
3. A system according to claim 2 wherein the parameter is stored in memory local to the monitoring device.
4. A system according to claim 2 or 3 wherein the parameter constitutes a maximum value and the error indication is produced when this is exceeded.
5. A system according to claim 4 wherein the maximum value is a maximum jackpot award.
6. A system according to claim 4 or 5 wherein the maximum value is notified to the monitoring device by the control unit of the machine.
7. A system according to claim 6 wherein notification occurs at an initial or starting stage.

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8. A system according to claim 7 wherein the initial or starting stage comprises power up.
9. A system according to any one of claims 6 to 8 wherein the notified value is derived from multiple supplied values.
- 5 10. A system according to claim 9 wherein the notified value is derived from the modal average of a predetermined number of first supplied values for each digit of a digital said display device.
- 10 11. A system according to any one of claims 1 to 10 wherein the error indication is given with reference to the existence or absence of a signal or signals.
12. A display system particularly for an entertainment machine of the kind which is operable by a player to play a game, wherein the system comprises a display device connected to a control unit of the machine to produce a display under the control of display signals received from the control unit, characterised in that the display device is also arranged to receive predetermined monitor signals from the control unit, and a monitoring device is provided which is responsive to the occurrence of anomalous such monitor signals to produce an error indication determined by such occurrence.
- 15 13. A system according to claim 12 wherein the monitoring device is arranged to receive repeated said monitor signals from the machine control unit.
- 20

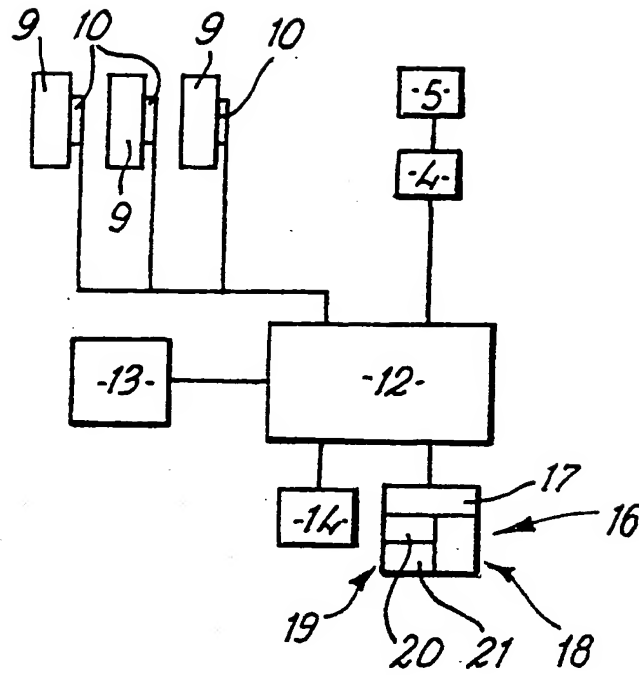
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14. A system according to claim 12 or 13 which is also a system according to any one of claims 1 to 11.
15. A system according to any one of claims 1 to 14 wherein the error indication is produced on the said display device.
- 5 16. A system according to any one of claims 1 to 15 wherein the display device is a multi-digit alphanumeric display device with a multicolour capability.
- 10 17. A system according to any one of claims 1 to 16 wherein the display device and the monitoring device form an integrated self-contained unit.
18. A system according to any one of claims 1 to 17 used with a coin-operated entertainment machine.

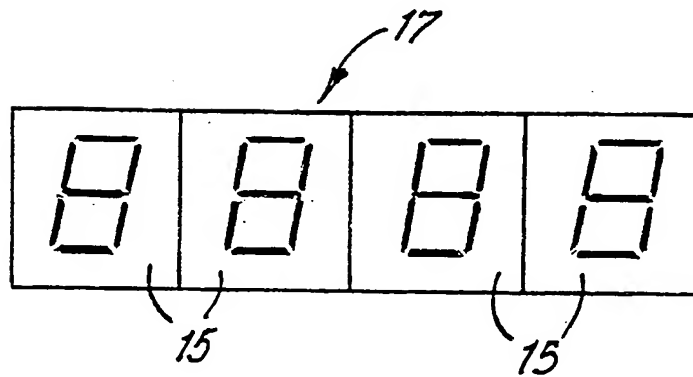


***FIG. 1***

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**FIG. 2**



**FIG. 3**

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# INTERNATIONAL SEARCH REPORT

I. national Application No

PCT/GB 00/01944

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G07F17/32

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G07F A63F G07D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 575 136 A (UNIVERSAL KK) 22 December 1993 (1993-12-22) abstract; figure 1 ---	1,11,12, 14,15,18
X	US 5 496 032 A (OKADA KAZUO) 5 March 1996 (1996-03-05)  column 5, line 61 -column 6, line 14 column 7, line 24 - line 35 column 8, line 15 - line 60 ---	1,2,4, 12, 14-16,18
X	US 3 825 255 A (KENNARD T) 23 July 1974 (1974-07-23) abstract; figures 1,2 column 3, line 17 -column 6, line 18 ---  -/--	1,2,12, 14,15,18



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

**\* Special categories of cited documents :**

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Date of the actual completion of the international search

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28/09/2000

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 00/01944

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
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Information on patent family members

I. International Application No

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